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Exam Preparation and Free Resources

Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

This question is about acidic solutions.

(a) The acid dissociation constant, K_a, for ethanoic acid is given by the expression

$$K_a = \frac{[CH_3COO^-][H^+]}{[CH_3COOH]}$$

The value of K_a for ethanoic acid is 1.74×10^{-5} mol dm^{-3} at 25 °C

A buffer solution with a pH of 3.87 was prepared using ethanoic acid and sodium ethanoate. In the buffer solution, the concentration of ethanoate ions was 0.136 mol dm^{-3}

Calculate the concentration of the ethanoic acid in the buffer solution.

Give your answer to three significant figures.

Concentration of acid = _____ mol dm^{-3}

(3)

(b) In a different buffer solution, the concentration of ethanoic acid was 0.260 mol dm^{-3} and the concentration of ethanoate ions was 0.121 mol dm^{-3}

A 7.00×10^{-3} mol sample of sodium hydroxide was added to 500 cm^3 of this buffer solution.

Calculate the pH of the buffer solution after the sodium hydroxide was added.

Give your answer to two decimal places.

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pH of buffer solution _____

(6)

(Total 9 marks)

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Q2.

The ionic product of water, $K_w = 2.93 \times 10^{-15}$ mol^2 dm^{-6} at 10 °C

(a) Which is the correct expression for K_w?

Tick (✔) **one** box.

A $K_w = \dfrac{[H_2O]}{[H^+][OH^-]}$ ☐

B $K_w = [H^+][H_2O]$ ☐

C $K_w = [H^+][OH^-]$ ☐

D $K_w = \dfrac{[H^+][OH^-]}{[H_2O]}$ ☐

(1)

(b) Calculate the pH of pure water at 10 °C

Give your answer to two decimal places.

pH of water _____

(2)

(c) Suggest why this pure water at 10 °C is **not** alkaline.

_____

_____

_____

(1)

(d) Calculate the pH of a 0.0131 mol dm^{-3} solution of calcium hydroxide at 10 °C

Give your answer to two decimal places.

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pH of solution _____

(3)

(e) The 0.0131 mol dm^{-3} calcium hydroxide solution at 10 °C was a saturated solution.

A student added 0.0131 mol of magnesium hydroxide to 1.00 dm^3 of water at 10 °C and stirred the mixture until no more solid dissolved.

Predict whether the pH of the magnesium hydroxide solution formed at 10 °C is larger than, smaller than or the same as the pH of the calcium hydroxide solution at 10 °C

Explain your answer.

pH of magnesium hydroxide compared to calcium hydroxide

_____

Explanation _____

_____

_____

(2)

(Total 9 marks)

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